DEPARTMENT OF TRANSPORTATION
HAZARDOUS MATERIALS REGULATIONS BOARD
WASHINGTON, D.C. 20590

[Docket No. HM-109; Amdt. Nos. 173-83, 179-15]

PART 173—SHIPPERS

PART 179—SPECIFICATIONS FOR TANK CARS

Tank Car Tank Head Shields

This amendment establishes a requirement for a protective shield for certain uninsulated tank car heads. The amendment was proposed on May 29, 1973, in Docket No. HM-109, Notice No. 73-4 (38 FR 14112). In that notice the Board stated that it believed this requirement would materially reduce the number of head punctures on tank cars carrying liquefied flammable compressed gases and thereby increase safety to the public and railroad employees.

Interested persons were invited to participate in this rulemaking proceeding and all comments received have been given full consideration by the Board. There were nineteen commenters on the Notice including representatives of the railroad industry and shippers. The interest shown and the comments expressed are appreciated by the Board.

All of the respondents were of the opinion that a regulation calling for head shields is premature and that a modified coupler design with a more positive means of preventing vertical displacement of freight cars during impact would be preferable. The Board does not agree with this position for the following reasons:

1. Statistical evidence already exists through testing that a head shield would be both effective in reducing tank head punctures and would also be cost beneficial. There have been three studies on tank car head shields. Results of these studies are as follows:

(a) The first study, Railroad Tank Car Safety Research and Test Project, was conducted by the Railway Progress Institute (RPI) and the Association of American Railroads (AAR) under an FRA contract. This report was submitted in August 1971. Damage data in the report were based on tank head punctures for the period 1965–1970. Benefits were based on the head shield being 77 percent efficient. The cost of application used in the report was developed by the tank car maunfacturers. The average costs of application used in this report were $280 for a new car and $335 for an existing car. The present value benefit of the head shield was computed in this study as the resultant of investing the annual per car damage savings for a thirty year period at an interest rate of 10 percent. The report stated that the net economic value of the head shield was $105 on new cars and $50 on existing cars.

(b) The Association of American Railroads submitted a report in November 1972 on tank car head shields. The same data base and statistical approach as used in the RPI/AAR report was employed. The AAR assumed that the head shield would be only 50 percent effective and estimated the cost to be $272 for new cars and $474 for existing cars. On this basis, the net economic value was negative. On new cars the economic loss was stated as $8 and on existing cars the economic loss was $210.

(c) Examination of the two reports by the FRA and the Calspan Corporation revealed that the separation of tank car head punctures from other tank shell intrusions accompanying or resulting from a head puncture may have caused bias in the data base discussed in (a) and (b) above. FRA totaled all shell puncture damage and assigned the portion to head punctures based on the percentage of incidents originating from a head puncture. Application costs were based on the highest estimates from both head shield reports. On this basis, the net economic value of the head shield is $395 on new cars and $201 on existing cars. The following table shows a comparison of the three reports.

ECONOMIC EVALUATION OF TANK CAR SHIELD

(Per Class DOT 112A and 114A Car)

Economic Assumptions:

1. Cost Estimates:

(a) RPI/AAR—Average cost based on manufacturers' rail industry estimates.

(b) Calspan Report entitled "Cost/Benefit Analysis of Head Shields for 112/114 A Series Tank Cars", dated March 1, 1974. (Report No. ZL–5226–D–1).

2. Head Shield Efficiency:

(a) RPI/AAR and AAR—Based on respective estimates of the ability of the head shield to prevent head punctures.

(b) FRA—Used lowest efficiency estimate.

3. Present value benefit is based on investment of the annual economic savings at 10% over a 30 year period.

4. Economic Savings:

(a) RPI/AAR and AAR—Based on estimated damage due to head punctures during period 1965–1970.

(b) FRA—Based on pro-rated estimated damage due to all tank instrusions during period 1965–1970.

	DOT–FR–00035 RPI/AAR 1(a) 9/71		AAR Submittal 1(a) 11/72		FRA-Calspan Contract No. DOT–FR–20069 1(b) 12/73	
	New	Existing	New	Existing	New	Existing
Estimated cost of applied head shield	$280	$325	$272	$474	$272	$474
Estimated efficiency [2] of head shield (percent)	77	77	50	50	50	50
Present value [3] benefit	$385	$385	$264	$264	$679	$679
Net economic value	$105	$50	−$8	−$210	$407	$205

2. The modified coupler design which consists of a standard coupler with top and bottom shelf has had little testing and there is no basis for assuming that it is superior to the head shield as a puncture preventative. In the event that the modified coupler design also proves cost beneficial, the head shield can serve as back up system and increase the total effectiveness of both. Some commenters were concerned about the 500,000 pounds dynamic force strength requirement. The Board concurs with their recommendation that the shield be designed to pass the normal impact test required for all tank cars. The regulation has been revised to reflect this change. For the purposes of clarity a new paragraph Head Shields (179.100–23) has been introduced rather than amend the paragraph captioned Tank Heads (179.100–8).

In developing the final rule in this proceeding, the Board seriously considered reducing by one or two years the proposed period for retrofitting the more than 18,000 existing DOT specification 112A and 114A tank cars with head shields. However, upon further consideration, it was determined that this task is of such a magnitude that it cannot be completed before December 31, 1977. Reducing the retrofit period by one or two years would only result in removal of many of these cars from service thereby further intensifying the energy crisis and severely restricting the rail movement of fuels, fertilizers, chemicals and liquefied compressed gases vital to the nation's economy. The Board believes that prompt action must be taken by tank car owners to ensure that all existing 112A and 114A tank cars are equipped with head shields by the end of 1977. Accordingly, the Board requests that each owner of these tank cars file with the Federal Railroad Administrator, Washington, D.C. 20590, by September 1, 1974, its head shield retrofit program or schedule, followed by annual progress reports to be filed by September 1 each year and a final report when the program is completed. The Board expects each owner to retrofit all of its tank cars with head shields as soon as possible and will not be receptive to petitions to extend the retrofit program completion date.

In consideration of the foregoing, 49 CFR Parts 173 and 179 are amended as follows:

I. In the table contained in paragraph (c) of § 173.314, Note 23 would be added and reference thereto made in Column 3 of the table in the following entries:

§ 173.314 Requirements for compressed gases in tank cars.

* * * * *

(c) * * *

Kind of gas	Maximum permitted filling density, note 1 (percent)	Required tank car, see § 173.31(a) (2) and (3)
Anhydrous ammonia	50	DOT-106A500-X, note 7.
	57	DOT-105A300-W.
	57	DOT-112A400-F, 112A340-W, 114A340-W, notes 15 and 23.
	56.8	DOT-112A400-F, 112A340-W, 114A340-W, notes 15 and 23.
Butadiene (pressure not exceeding 255 lb/in² at 115° F), inhibited.	Notes 18 and 21	DOT-112A340-W, 114A340-W, notes 4, 20, and 23.
Butadiene (pressure not exceeding 300 lb/in² at 115° F), inhibited.	Notes 18 and 21	DOT-112A400-W, 114A400-W, notes 4, 20, and 23.
Liquefied petroleum gas (pressure not exceeding 255 lb/in² at 115° F).	Note 18	DOT-112A340-W, 114A340-W, notes 4, 20, and 23.
Liquefied petroleum gas (pressure not exceeding 300 lb/in² at 115° F).	Note 18	DOT-112A400-F, 112A400-W, 114A400-W, notes 4, 20, and 23.
Methylacetylene-propadiene, stabilized	Note 22	DOT-105A300-W, 112A340-W, 114A-340W, 106A500-X, notes 4, 9, and 23.
Vinyl chloride, note 9	84	DOT-106A500X, note 7.
	87	DOT-105A200W, notes 4 and 16.
	86	DOT-112A340W, 114A340W, notes 4 and 23.

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NOTE 23: Specification 112A or 114A tank cars used for transportation of compressed gases must be equipped with protective head shields after Dec. 31, 1977. See sec. 179.100-23 for head shield specification.

II. In § 179.100, add a new subsection to read as follows:

§ 179.100-23 Head shields.

(a) After August 30, 1974, each end of a specification DOT-112A and 114A tank car must be equipped with a protective head shield. The shield must be:

(1) At least ½-inch thick, and made from steel produced in accordance with specification ASTM A242 or ASTM A572 GR. 50;

(2) In the shape of a trapezoid with the following dimensions:

(i) A minimum width at the top of center sill of 4 feet 6 inches;

(ii) A minimum width at the top of the shield of 9 feet 0 inches;

(iii) The top corners of the shield rounded to a minimum radius of 9 inches;

(iv) The bottom corners of the shield rounded to a minimum radius of 3 inches;

(v) All inside edges of the shield chamfered to a minimum radius of ¼ inch; and

(vi) A minimum height of 4 feet and 6 inches;

(3) Shaped to the contour of the tank shell head, utilizing a minimum of three vertical bend lines; and

(4) The head protection device must meet the impact test requirements of paragraph AAR. 24-5 in the "Specifications for Tank Cars" Standard, effective October 1, 1972. The impact test acceptance criterion is that the device and its supporting structure does not sustain visible permanent damage or deformation such as fractures, cracks, bends and dents. The object of this requirement is to assure that the head shield has adequate strength to remain attached and functionally unimpaired during normal operations.

The head protection device must meet all of the workmanship requirements of the "AAR Specifications for Design, Fabrication and Construction of Freight Cars, dated September 1, 1964."

This amendment is effective August 30, 1974. However, compliance with the regulations, as amended herein, is authorized immediately.

(Secs. 831-835 of Title 18, United States Code, sec. 9, Department of Transportation Act (49 U.S.C. 1657))

Issued in Washington, D.C. on July 23, 1974.

JOHN W. INGRAM,
Federal Railroad Administrator
Member, Hazardous Materials Regulations Board.

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